RANDSEL: Randomly selecting and assigning animals to treatment groups

Robert T. Sugihara

Efficient, random selection and allocation of animals to experimental treatment groups is a prime concern for experimental biologists and statisticians. The Animal Welfare Act and U.S. Environmental Protection Agency Good Laboratory Practice regulations have elevated aspects of these statistical concerns to regulatory issues (Engeman and Shumake 1993). Computerized assignment of animals to treatment groups greatly facilitates meeting these statistical and regulatory requirements (Sugihara 1992).

RANDSEL is an interactive computer program developed at the National Wildlife Research Center's (NWRC) Hawaii Field Station as a quick and easy method for assigning animals to treatment groups while addressing statistical concerns and meeting regulatory record-keeping requirements. RANDSEL is used to search a dataset of quarantined animals to select animals for testing based on user-specified criteria for species, sex, and weight ranges. To avoid confounding treatment effects with those due to animal weights, the program blocks animals by weight groups prior to assigning them to treatment groups. This restriction on randomization should be considered when selecting appropriate analysis methods. The random-number generator (Bratley et al. 1983:180–213), which produces a sequence of pseudo-random numbers in the selection and randomization process, has been extensively tested for accuracy and nonperiodicity (Brody and Morais 1987).

Users can import data from an existing database file (ASCII text format) or enter it interactively when executing the program. Other variables besides species, sex, and weight may be specified to control record selection and treatment assignment. The program will accept data consisting of 2 categorical variables, a record-identification field, and a measured continuous variable. Records can be entered in any order because RANDSEL automatically sorts the records. If an existing database file is used, a header describing the data format must be placed at the top of the input file. Each record must appear on a separate line. The current program can accept ≤5,000 records, however, this may be increased based on available computer (RAM) resources.

After data is entered, the user specifies the desired selection criteria (e.g., species, sex, weight limits), the number of treatments (NT), and the number of animals (replicates)/treatment (NR). For each species and sex combination, the user can select a lower and upper body-weight limit (e.g., male Norway rats ≥100 g and ≤ 200 g). The user then selects a random number seed to initiate the pseudo-random number generator and start the random selection.

RANDSEL randomly selects the appropriate number of animals, based on the selection criteria, NT and NR, from the pool of available animals. It then ranks these animals by weight, from the lightest to the heaviest, and divides them into NR weight groups. The program then randomly assigns a treatment to each individual in each weight group. If the required number of animals (NT x NR individuals) are not found in the pool, the program prompts the user to repeat the process with a different set of selection criteria or exit the program.

For each run, RANDSEL reports: (1) selection criteria, (2) a list of animals that meet the selection criteria, (3) the number of and a list of the randomly selected animals, and 4) a list of randomly selected animals with assigned treatments. The user can then choose another sex or species-sex combination and execute the selection process again or exit the program. Optionally, the user can print program results.

Author's address: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control, National Wildlife Research Center, P.O. Box 10880, Hilo, HI 96721-5880, USA.

Key words: animal selection, random assignment, randomization, treatment groups

Wildlife Society Bulletin 1997, 25(1):183–184 **Peer refereed**

Researchers at the NWRC Hawaii Field Station have found that RANDSEL significantly reduces the time required and number of errors involved in selecting and assigning animals to experimental treatment groups. They can, for example, quickly select 10–20 males and females from each of 3 rat species for feeding bioassays involving 3–4 different baits, randomly assign them to treatment groups, and obtain complete printed documentation in <1 minute.

RANDSEL can be installed on any standard IBM-compatible microcomputer running the MS-DOS or OS/2 operating system. The program is written in FORTRAN 77, and the compiled executable file uses 228K bytes of RAM. A math coprocessor is recommended for accessing large datasets. Data files created with other database software and converted to standard ASCII format can also be used. The executable program file, an example input animal data file, and a user's manual will be provided upon request by sending a formatted 3.5- or 5.25-inch floppy disk and a stamped, self-addressed mailing container to: Robert T. Sugihara, USDA/APHIS, National Wildlife Research Center, Hawaii Field Station, P.O. Box 10880, Hilo, HI 96721. RANDSEL is also available through the Bird Monitor bulletin board (301-497-5831), FTP site: ftp.im.nbs.gov in /pub/software/CSE, or World Wide Web site at http://www.im.nbs.gov/tws/cse.html.

Acknowledgments. I thank M. E. Tobin, project leader, for providing the opportunity and resources to develop this and other computer applications that have greatly simplified and improved the efficiency of research operations at the NWRC Field Station. M. E. Tobin, R. M. Engeman, and A. E. Koehler suggested improvements and critically reviewed earlier drafts of this manuscript.

Literature cited

Bratley, P., B. L. Fox, and L. E. Schrage. 1983. A guide to simulation. Springer-Verlag, New York, N.Y. 383pp.

Brody, M., and D. Morais. 1987. UNIF is a fast, reliable random number generator for IBM-AT microcomputer. U.S. Fish and Wildl. Serv. Res. Info. Bull. No. 87-84.

Engeman, R. M., and S. Shumake. 1993. Animal welfare and the statistical consultant. Am. Stat. 47(3):229-233.

Sugihara, R. T. 1992. Use of microcomputers for randomly assigning animals to treatment groups, formulating baits, and keeping records. Proc. 15th Vertebr. Pest Conf. 15:249-251.

Robert (Bob) T. Sugihara is a Wildlife Technician with the U.S. Department of Agriculture's National Wildlife Research Center's Hawaii Field Station based in Hilo, Hawaii. He received a B.S. in Tropical Agriculture from the University of Hawaii at Manoa. Bob has 20 years of wildlife research experience with the U.S. Departments of Interior and Agriculture, focusing on rodent damage problems in Hawaiian agricultural crops and conservation areas. He has a special interest in microcomputers and the development of computer applications to increase research productivity.

Software Editor: Smith